

PROGNOSIS AND COMPLICATIONS OF TRACHEAL STENOSIS AND TRACHEAL RECONSTRUCTIVE SURGERY IN PATIENTS REFERRED TO AL-ZAHRA HOSPITAL IN ISFAHAN PROVINCE DURING A TEN-YEAR PERIOD: A SINGLE REFERRAL CENTER EXPERIENCE

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ABSTRACT

The aim of this study is, to evaluate the prognosis and complications of tracheal stenosis and tracheal reconstructive surgery. This descriptive study was conducted on patients with surgical repairing of tracheal stenosis in thorax surgery center of Al-Zahra hospital in Isfahan province (center of Iran) during a ten-year period (April 2003 to March 2013). Sampling method was census and information was collected through researcher by a questionnaire including demographic characteristics, post-operative complications, the number of need for bronchoscopy and the current status of patients, presence of tracheostomy at the time of presentation, intubation causes, intubation period, type of endotracheal tube, clinical symptoms of tracheal stenosis, time of beginning of symptom after extubation, length of removed part of trachea, complications, time of hospitalization, and the view of patients about their status after surgery. After collecting and completing information about patients, the data was analyzed through descriptive statistical techniques using SPSS software. Fifty-two patients with surgical repairing of post-intubation tracheal stenosis were studied, 75% of them were males. The mean age of patients was 39.15 ± 2.67 years old. The most common chief complaint was dyspnea in 39 patients (75%). Wound infection was recorded in 4 patients (7.7%), as well as dysfunction of vocal cord was recorded in 8 cases (15.4%) and anastomosis failure was recorded in 1 patient (1.9%). On the other hand, recurrence of stenosis occurred in 11 patients (21.2%). Failure of surgical treatment observed in 14 patients (3 cases dead during or after surgery and 11 cases required re-dilatation). The surgical treatment was successful in 38 other cases (73%). We note that by adding the 7 cases that were improved by re-dilatation the success rate of surgical treatment increase from 73% to 86.5%. Tracheal stenosis is one of the important complications of intubation. This complication is the most common cause of partial resection of trachea. So recognizing these complications is helpful for effective treatment planning.

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INTRODUCTION

One of the major complications of intubation is tracheal stenosis that caused physical discomforts and high therapeutic costs for patients. Intubation is one of acts that is often done for very ill patients, which can cause changes in the structure of the trachea and in some cases lead to tracheal stenosis [1]. Intubation-induced tracheal stenosis can complicate the treatment of patients and increase mortality risk in these patients [2]. This problem occurs at 19% of the tracheal intubation cases [3].

This disorder is the most common cause of partial removal of trachea [4]. Different factors create this complication; which one of the most important factors is the duration of intubation that there is no consensus about its role. Other important factors including: some underlying diseases (such as diabetes) and any factors that will delay repairing of the lesion [5]. The main pathophysiology of intubation-induced tracheal stenosis are cuff pressure of tracheal tube, chronic inflammation and fibrosis [6].

Intubation-induced tracheal stenosis is affected by patient factors [7], used tools [8] and expertness of the person who performs intubation [9]. So, accurate identification of each of these factors can play a main role in the prevention of Intubation-induced tracheal stenosis. The aims of this study are to evaluate the result and complications of tracheal stenosis and its repairing surgery, and to reduce the consequences and mortality rate of this disease.

MATERIALS AND METHODS

This descriptive study was conducted on patients with surgical repairing of tracheal stenosis in thorax surgery center of Al-Zahra hospital in Isfahan province (center of Iran) during a ten-year period (April 2003 to March 2013). Patients with incomplete medical profile and unavailable patients were excluded from the study. Sampling method was census and the medical records of all patients who underwent surgical repair of trachea was assessed. Information was collected through researcher by a questionnaire including demographic characteristics, post-operative complications, the number of need for bronchoscopy and the current status of patients (dyspnea, impaired daily function, irritative cough, hoarseness, having or not having a tracheostomy), presence of tracheostomy at the time of presentation, intubation causes (trauma, suicide, brain surgery and other causes), intubation period, type of endotracheal tube (with or without cuff), clinical symptoms of tracheal stenosis (dyspnea, cough, or stridor), time of beginning of symptom after extubation, length of removed part of trachea, complications (wound infection, recurrent stenosis, vocal cord dysfunction, pneumonia, anastomotic failure), time of hospitalization, and the view of patients about their status after surgery (much better, better, no matter, worse).

The validity of study was confirmed by expert panel. After collecting and completing information about patients, the data was analyzed through descriptive statistical techniques (standard mean scores, ratios, frequency percent and Fishers exact test).

RESULTS

We examined 64 patients using the inclusion criteria. Twelve patients were ineligible for the study because of incomplete medical profile and unavailable patients. Finally 52 patients were enrolled to this study. The mean age of patients was 39.15 ± 2.67 years old. Also, the 75% of patients were males and 25% of them were females. The frequency distribution of the demographic characteristics of the patients is presented in [Table-1] in detail.

Table: 1. Frequency distribution of the demographics of the patients

Type of variable	Patients N (%)	
Age groups	20-39	2 (3.8)
	40-59	19 (36.6)
	60-79	27 (51.9)
	>80	4 (7.7)
Sex	Male	39 (75)
	Female	13 (25)
Marital status	Married	43 (82.7)
	Single	9 (17.3)
Educational attainment	Illiterate	2 (3.8)
	Junior high school or less	7 (13.5)
	High school or High school diploma	10 (19.2)
	University	33 (63.5)
Occupation	Office employee	12 (23.1)
	Laborer	4 (7.7)
	Self-employed	10 (19.2)
	Unemployed	10 (19.2)
	Housewife	7 (13.5)
	Farmer or Stockbreeder	9 (17.3)

The results show that, 18 patients (34.6%) due to trauma, 1 case (1.9%) due to suicide, and 33 cases (63.5%) due to brain surgery were intubated, which based on age and state of them intubation was performed using cuffed endotracheal tube. Also, the chief complaints of patients were dyspnea in 39 patients (75%), coughing (without dyspnea) in 4 cases (7.7%), both symptoms (cough with dyspnea) in 5 (9.6%) cases and stridor in 1 (1.6%) case.

In addition, 25 patients (48%) had received tracheostomy before admission, that on average, 7.49 ± 3043 months after extubation were candidate for surgery (resection and anastomosis). On average, patients were intubated 21.69 ± 17.79 days. The average length of resected trachea was 2.44 ± 0.84 cm.

Wound infection was recorded in 4 patients (7.7%), as well as dysfunction of vocal cord was recorded in 8 cases (15.4%) and anastomosis failure (this was due to the long length of stenosis that required the lot release trachea and in ICU due to patient's agitation neck sutures was removed within 1 day) was recorded in 1 patient (1.9%). No case of pneumonia was reported. Recurrence of stenosis occurred in 11 patients (21.2%), that 2 cases of them had tracheostomy and 2 other cases had dyspnea without obvious dysfunction as well as 7 patients of them were improved after re-dilatation. Also 3 deaths occurred during and after surgery that 1 case occurred during surgery due to cardiac arrest and 1 case occurred due to anastomotic disruption after surgery; and 1 case died due to heart attack in 1 day after surgery.

Bronchoscopy was performed in 21 patients after surgery, so that in ten patients bronchoscopy was performed just for evaluation of anastomosis status and location but bronchoscopic dilatation was performed in 11 other patients (3 times in 2 cases, 2 times in 1 case and 1 time in 8 cases).

Two patients (3.8%) that had sub glottis stenosis underwent extensive resection surgery, which due to restenosis after surgery were undergoing bronchoscopy, finally, tracheostomy performed for them after failure of bronchoscopy.

Also two patients (3.8%) had dyspnea on exertion (without impairment in their daily function). Three patients (5.8%) had hoarseness. None of the patients had irritative cough.

Investigating the view of patients about their status after surgery showed that, 26 cases (50%) believe that their status is much better, 18 cases (34.6%) believe that their status is better, 6 cases (11.5%) believe that there is no change and 2 cases (3.8%) believe that their status is worse than before surgery. Failure of surgical treatment observed in 14 patients (3 cases dead during and after surgery and 11 cases required re-dilatation). The surgical treatment was successful in 38 other cases (73%). We note that by adding the 7 cases that were improved by re-dilatation the success rate of surgical treatment increase from 73% to 86.5%.

DISCUSSION

Tracheal stenosis is a serious and life threatening disease [10] with various causes including intubation, tracheostomy, trauma [10, 11] tumors [10] burns [12] and idiopathic causes [13].

Despite the known etiology of post-intubation tracheal stenosis and the variety of preventive methods [14, 15], increased using of intubation for airway protection caused high incidence of tracheal stenosis [10, 13]. In fact, post-intubation tracheal stenosis is the result of regional ischemic necrosis of the airways [16].

Although tracheal injuries are accompanied by different symptoms but the diagnosis of these injuries is difficult in many cases. Appropriate radiographic tests like fluoroscopy, tomography and CT-scan can use for ruling out the possibility of tracheal damage in symptomatic patients (symptoms of airway obstruction) with normal lung fields on chest X-ray. Rarely, advanced techniques failed in diagnosis of atypical lesions, so bronchoscopy is indicated in this cases [17].

Evaluation of pulmonary function in patients with tracheal obstructive lesions, showed a high degree obstruction of airways. Sometimes this evaluation can determine the presence of parenchymal diseases, and in some cases the need for more extensive surgeries. Functional tests, especially Forced Expiratory Volume in one second (FEV1) and maximum expiratory flow-volume curve can provide suitable base for evaluation of the results.

Therapeutic methods of tracheal stenosis including endoscopy using laser, endoscopic dilatation, interposition graft, tracheal stenting, and resection and reconstruction (gold standard in benign tracheal stenosis treatment) [11, 15, 18]. On the other hand, post-intubation tracheal stenosis is the most common indication for resection and reconstruction [14, 15, 16], but in patients who are not appropriate candidates for surgery, tracheal stenting is a better treatment [10, 11].

As seen above, our finding about mean age of patients (the mean age of patients was 39.15 ± 2.67 years old) not confirmed the results of other studies (the mean age of the patients who required intubation in other studies, is

between 17 to 30 years old [9], which this finding can be due to selecting the study patients from cases who had underlying diseases and brain surgery that have usually old age.

Stenosis of airways after intubation affected by different factors such as intubation period, that based on our result (intubation period was 21 days, on average), we emphasize the necessity of appropriate planning for making decision aimed to reduce intubation period.

In present study, extubation to surgery lasted 7.49 ± 3043 months on average, which this long term is consistent with brain surgery (most common cause of intubation (65%)) and its complications that lead to long term movement disorder. In fact, inactivity will lead to shrinkage of airway and reduce the diameter of the airway, before clinical symptoms were appeared, in this circumstances fatal obstruction can be occur at any time [19].

Also, length of resected trachea is one of the factors that directly linked with recurrence of stenosis after surgery [20]. So we can said that the high success rate of this study can be caused by the length of resected trachea that was 2.44 ± 0.84 cm on average.

In the context of view of patients about their status after surgery, 84.6% of them feel health, that this finding consistent with success rate of surgical treatment that was 86.5%. Finally, according to this fact that the best way to manage the complications of tracheal stenosis surgery is prevent them, so recognizing these complications is helpful for effective treatment planning.

CONCLUSION

Tracheal stenosis is one of the important complications of intubation. This complication is the most common cause of partial resection of trachea [4]. So recognizing these complications is helpful for effective treatment planning.

CONFLICT OF INTEREST

The authors declare no conflict of interests.

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